PROC. BIOL. SOC. WASH.
92(4), 1979, pp. 863–872

A REDESCRIPTION OF THE WOOD-RASPING AMPHIPOD *TROPICHELURA GOMEZI* ORTIZ, 1976 (CHELURIDAE) FROM THE FLORIDA KEYS, WITH NOTES ON ITS DISTRIBUTION AND ECOLOGY

James Darwin Thomas

Abstract.—The wood-rasping amphipod, *Tropichelura gomezi* Ortiz, 1976, is redescribed from the Florida Keys to include diagnostic characters omitted in the original description. Morphological characters and distributional patterns of *T. gomezi* are compared with those of the other member of the genus, *Tropichelura insulae* (Calman, 1910). Laboratory studies show that *T. gomezi* defends its burrow entrance from other members of its species, but tolerates the presence of limnoriid isopods with which it co-occurs. A lectotype for *Tropichelura insulae* is designated.

Introduction

Recent investigations on the littoral marine amphipod fauna of the Florida Keys have yielded a wood-rasping amphipod, tentatively identified as *Tropichelura gomezi* Ortiz, 1976, originally described from Cuban waters. Adult specimens of *T. gomezi* from the Florida Keys exhibit distinctive sexual and morphological differences not included in Ortiz' original description. Ortiz' collection from which the holotype (a female, 5.0 mm in body length) was designated lacked larger specimens in the 8–12 mm size range where primary sexual characters are more pronounced. Females in the 4–5 mm range superficially resemble males but are readily distinguished from them by the presence of paired telsonic setae.

Although requests for topotypes of *T. gomezi* have been unsuccessful, examination of identical material of wood-rasping amphipods from Belize, Puerto Rico, and the Tortugas tends to confirm material from the Florida Keys as *T. gomezi*. On this assumption, this study purports to redescribe and refigure *Tropichelura gomezi* and provide new information on its ecology and life history. *T. gomezi* is compared with the only other member of the genus, *T. insulae* (Calman, 1910).

The Cheluridae, a small family of corophioidean amphipods, was revised by Barnard (1959) to include 3 genera: *Chelura* Philippi, *Nippochelura* Barnard, and *Tropichelura* Barnard. *Chelura*, represented by a single species,

Chelura terebrans Philippi, 1839, is widely distributed in warm temperate seas and is distinguished by the presence of an inner ramus on uropod 3. *Nippochelura,* also represented by a single species, *Nippochelura brevicauda* (Shiino, 1948), is reported only from Japanese waters and is characterized by having uropods 2 and 3 uniramous. *Tropichelura* is tropical in distribution and composed of 2 species, *Tropichelura insulae* (Calman, 1910), and *Tropichelura gomezi* Ortiz, 1976 and is distinguished by a biramous second uropod and a uniramous third uropod.

The ecology of chelurids dates from 1839, when Philippi first described *Chelura terebrans* from marine wood borings. Because of the economic importance of chelurids, the literature on this small group of marine amphipods is surprisingly extensive; more than 65 papers on *C. terebrans* alone have been published. Investigations on the ecology of *C. terebrans* by Barnard (1955) determined that limnoriid isopods initiated burrows that were subsequently invaded and enlarged by *Chelura*. Miller (1924) reported *Tropichelura insulae* abundant in marine timbers in Samoa, where this species enlarged the burrows of *Paralimnoria andrewsi* (Calman) for its own occupancy. Ortiz (1976) recorded *T. gomezi* associated with the isopod *Limnoria platycauda* (Menzies) from the Gulf of Batabanao, Cuba. In the Florida Keys, *T. gomezi* was taken with *Paralimnoria andrewsi, Limnoria platycauda,* and *Limnoria simulata* (Menzies). My observations show that *T. gomezi* is a very active burrower, connecting and enlarging limnoriid burrows into large, unroofed galleries by rasping and furrowing of the softer wood grain.

Tropichelura gomezi is stenohaline and occurs in protected coastal bays and other shallow habitats (less than 3 m) that are not subject to significant salinity fluctuations. *T. gomezi* was conspicuously absent from harbor and open ocean situations, even though numerous samples of submerged timbers were examined from these areas. Samples taken from harbor areas held large numbers of limnoriids, while the ocean samples were riddled with the shipworm, *Toredo*.

Tropichelura gomezi Ortiz
Figs. 1–4

Tropichelura gomezi Ortiz, 1976: pp. 21–26, figs. 1–2.

Diagnosis.—Antenna 1, article 1 expanded anterolaterally, articles 1–3 cylindrical, length 2.5× width. Maxilla 2, internal lobe with 14–16 terminal setae. Gnathopod 2, palm transverse, defined by strong tooth, 90% of propodus. Pereopod 7, article 2 linear, length 2× width.

Description.—Male, 12.0 mm. Head normal for genus; supra-antennal line present; eyes large, black-pigmented.

Antenna 1 short, accessory flagellum small, 1-segmented; flagellum short,

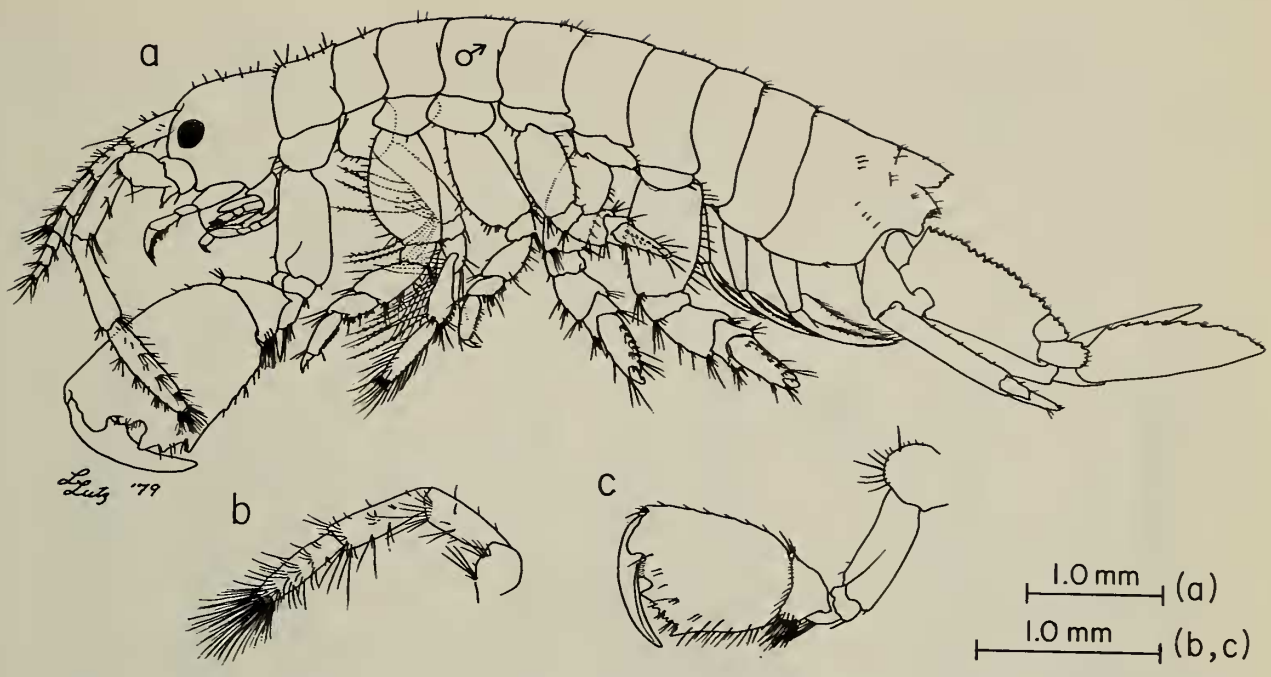

Fig. 1. *Tropichelura gomezi*: a, Lateral view, 12.0 mm ♂; b, Antenna 2, ♀; c, Gnathopod, ♀.

sparsely setose distally. Antenna 2 stout; flagellum of 1 clavate article; sparsely setose distally.

Upper lip with epistome produced; labrum flattened distally. Mandible with 3-segmented palp, article 2 with row of oblique setae, article 3 with numerous comb setae, 2 apical setae; molar large, molar surface rasp-like; incisor toothed; 8 raker spines present. Lower lip with inner lobes undeveloped; mandibular process present. Maxilla 1 with 2-segmented palp, 2nd segment with 5 spines and 2 apical setae; outer plate with 9 pectinate spines; inner plate reduced, 6 plumose setae medially. Maxilla 2, inner plate with 16–17 plumose setae; outer plate with 10–12 plumose setae. Maxilliped, palp 4-segmented, exceeding outer plate; terminal article with distal spine.

Coxae 1–7 small; 5–6 bilobed; gills sac-like, present on coxae 2–6; Gnathopod 1 large; palm transverse, defined by tooth. Gnathopod 2 minutely subchelate; articles 2–5 with long, pectinate setae anteriorly; article 5 with 5 rows of comb spines.

Pereopod 3, article 2 slightly expanded anteriorly, anterior margin with 13 stout setae, posterior margin bare; article 3 lacking marginal setae; article 7 with 2 accessory nails. Pereopod 4, article 2 slightly produced anteriorly, anterior margin with 10 stout setae, posterior margin bare; article 7 with 2 accessory nails. Pereopod 5, coxal lobes subequal; article 1 bilobed; article 2, widely expanded, posterior margin with 8 plumose setae; article 4, posterior margin bare; article 6 with 5 large spines laterally, paralleled by 5 thinner spines; 2 large spines present at junction of articles 6 and 7. Pereopod 6, article 2 slightly expanded, posterior margin bearing 8 plumose

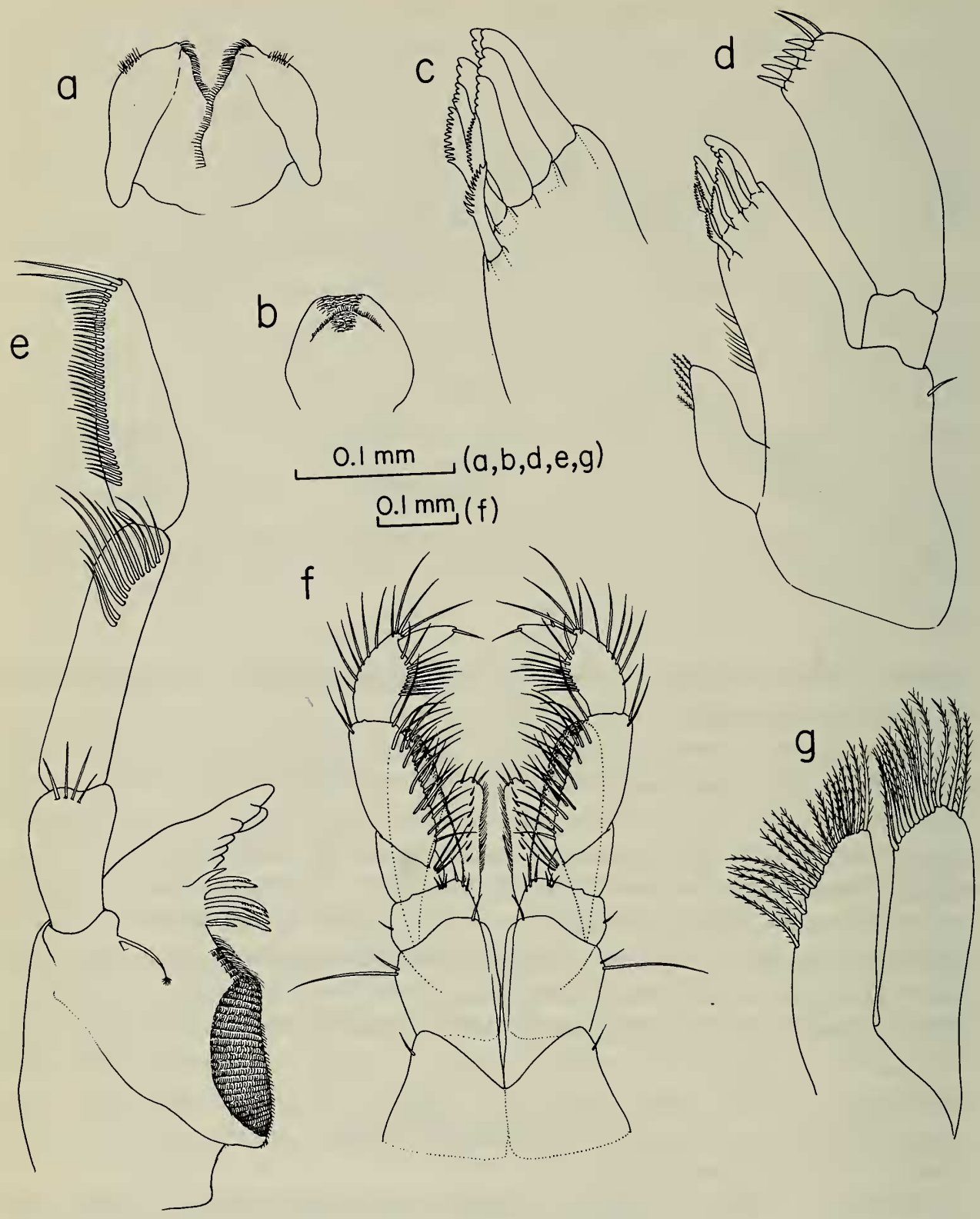

Fig. 2. *Tropichelura gomezi*, ♂: a, Lower lip; b, Upper lip, c, d, Maxilla 1; e, Mandible; f, Maxilliped; g, Maxilla 2.

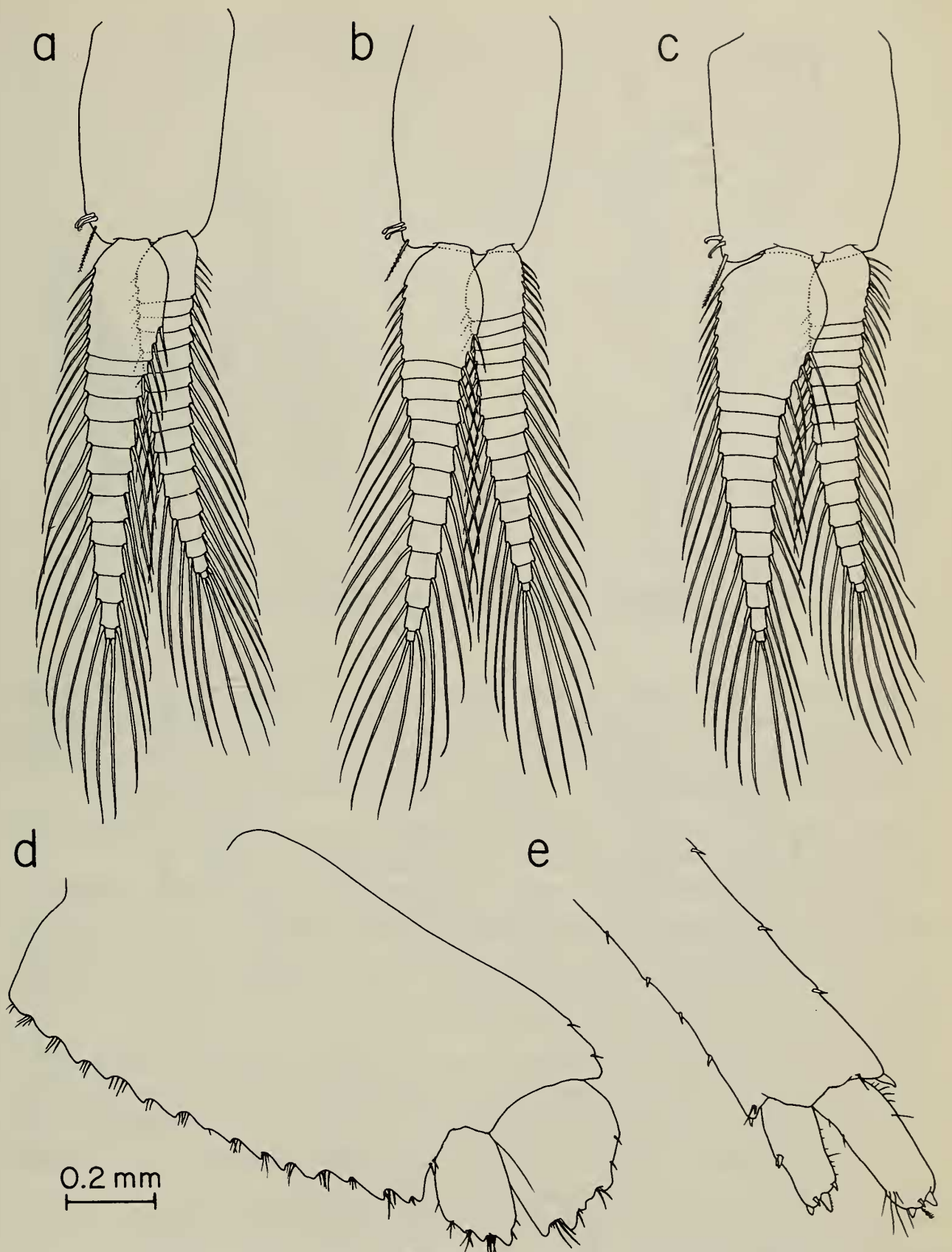

Fig. 3. *Tropichelura gomezi*, ♂: a, Pleopod 1; b, Pleopod 2; c, Pleopod 3; d, Uropod 2; e, Uropod 1.

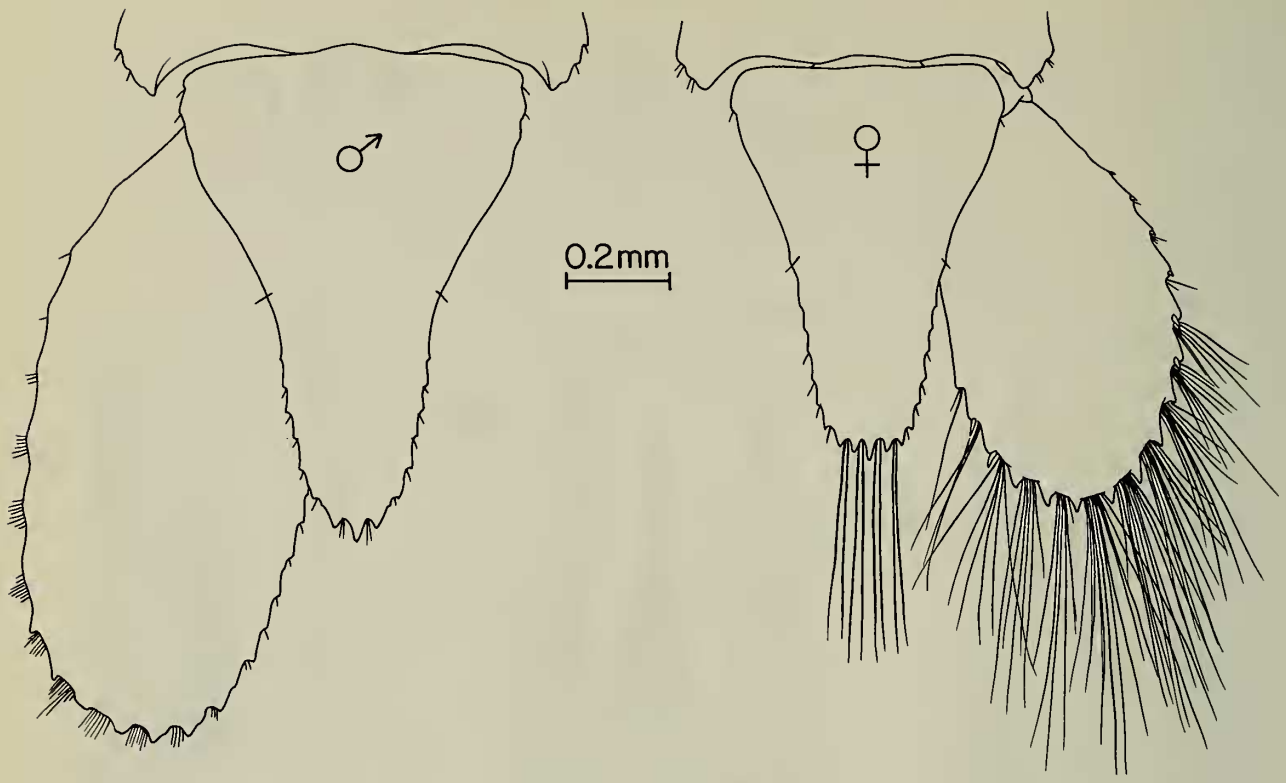

Fig. 4. *Tropichelura gomezi*: Telson and uropod 3 of ♂ and ♀.

setae; article 6 with 3 pairs oblique spines; article 7, plumose setae present. Pereopod 7, article 2, length twice width, posterior margin with 14 plumose setae; article 6 with 6 pairs of large, oblique spines; 2 large spines present at junction of articles 6 and 7; article 7, single plumose seta present.

Pleon segment 3 with 3 dentate tubercles posterodorsally. Pleopod peduncles each with 2 coupling hooks and single plumose seta.

Uropod 1 biramous, inner ramus longest; peduncle normal. Uropod 2 biramous, rami serrate; peduncle flattened and expanded, serrate laterally; few short setae present in serrations. Uropod 3, uniramous, ramus flattened and ovate, moderately serrate; few short setae between serrations. Telson apically serrate; notches with minute setae.

Females.—Antenna 2, flagellum heavily setose distally. Gnathopod 2 smaller than but similar to male. Pereopods 6 and 7, posterior edge article 2 heavily setose in ovigerous specimens. Urosome with numerous, long setae laterally and ventrally. Telson with 4 apical notches, each bearing long, paired setae. Oostegites present on pereopods 2–5.

Distribution.—Tropical Atlantic: Florida Keys, Dry Tortugas, Cuba, Belize, and Puerto Rico.

Ecology.—Taken from sublittoral timbers and decaying red mangrove roots.

Relationships.—While *T. gomezi* and *T. insulae* have obvious morphological differences on the specific level (antenna 1, articles 1–3; palm, gnathopod 1; article 2, pereopod 7), they also share several similarities wor-

Table 1.—Comparisons of selected characters of *T. gomezi* and *T. insulae*.

Character	*T. gomezi* (male, 10.5 mm)	*T. gomezi* (female, 6.5 mm)	*T. insulae* (male, 8.5 mm)	*T. insulae* (female, 5.5 mm)
ant. 1	art. 1 expanded antero-laterally; art. 1, 2, 3, cylindrical, length 2.5× width	as males	art. 1, 2, 3, d.v. flattened, concave ventrally, length 6× width	as males
ant. 2	flagellum with few distal setae; 23% BL	flagellum heavily setose distally; length as males	flagellum heavily setose; 50% BL	flagellum heavily setose
max. 2	internal lobe with 16 terminal setae	as males	internal lobe with 4 terminal setae	as males
gn. 1	palm transverse, defined by strong tooth, 90% propodus	as males, reduced	palm oblique, weakly defined, 50% propodus	as males, reduced
pd. 7	art. 2 linear, length 2× width	as males, post. edge art. 2 heavily setose in ovig. spec.	art. 2 broadly expanded post., almost long as wide	as males, art. 2 not heavily setose in ovig. spec.
u1–u3	setae sparse, short	heavily setose, setae long	heavily setose, setae long	setae sparse, short
telson	2 notches, short setae	4 pairs terminal setae	4 terminal setae	2 notches, short setae

thy of mention. Females of *T. gomezi* show a resemblance to males of *T. insulae* in the setose conditions of the flagellum on antenna 2, the urosome, and apical telsonic setae. Males of *T. gomezi* have sparsely setose urosomes as do females of *T. insulae*. The relative amount of setae on the urosome is considered a diagnostic character and the two species of *Tropichelura* show a relationship in this condition; the males of *T. gomezi* being similar to females of *T. insulae,* and females of *T. gomezi* resembling males of *T. insulae*.

In the original species description, Ortiz (1976) reported that *T. gomezi* differed from *T. insulae* in having a quadrangular versus rectangular urosome, and in the relation of the size of the third uropod. My observations show these characters to be variable and of questionable diagnostic use.

Material examined:—INDIAN OCEAN: *Tropichelura insulae* (Calman, 1910).—British Museum (Natural History), Lectotype: 1978.291.1 (herein designated); male, 8.0 mm, taken from wooden pilings in Flying Fish Cove, Christmas Island, 1909. Paralectotypes: 1909.5.19.305–314. PACIFIC OCEAN: *Tropichelura insulae*.—National Museum Natural History, USNM 151391, Pearl Harbor, 1949. ATLANTIC OCEAN: *Tropichelura gomezi* Ortiz, 1976.—USNM 172091, Florida Keys, 1978.—USNM 1972096, Dry Tortugas, 1908.—JDT Bel. 2, Carrie Bow Cay, Belize, 1979.—Magueyes Island, Puerto Rico, specimens sent by Roger Zimmerman, 1978.

Remarks.—Barnard (1959, 1971) reported *T. insulae* as circumtropical and occurring throughout the Caribbean region. However, these records were no doubt erroneous and included records of the then undescribed *T. gomezi*. Distribution of *T. gomezi* in southern Florida and the Bahamian-Caribbean province is not known and awaits studies on additional material from these areas. Of pertinent interest would be material from the tropical coast of western Africa, a region from which no chelurids have been reported, although they are probably present there.

Tropichelura is tropical in distritution, *Nippochelura* and *Chelura* are warm-temperate. *T. insulae* is widespread in the Pacific and Indian Oceans, while *T. gomezi* appears limited to the tropical Atlantic. *Chelura terebrans* ranges widely, being taken from both coasts of the U.S., Bermuda, western Europe, the Mediterranean, West and South Africa, the Suez Canal, and Australia. *Nippochelura* is endemic and recorded only from coastal Japan.

Dispersal of chelurids is probably effected by timbers, ships, buoys, and other wooden flotsam. The present distribution of chelurids reflects some degree of isolation and speciation. As rafting is an effective dispersal mechanism across large oceanic regions, chelurids might therefore be expected to occur widely in coastal situations throughout the world, especially where near-oceanic conditions persisted in close proximity to land. While this hypothesis holds true for the species of *Tropichelura, Chelura* is found in both estuarine and near-oceanic situations.

The paucity of information in tropical areas probably reflects inadequate sampling. On the other hand, the voluminous published information pertaining to *C. terebrans* is a tribute to the negative economic impact of this wood-destroying organism.

Laboratory investigations were conducted on *T. gomezi* in submerged timbers, and showed the amphipod to move actively throughout the excavated galleries constantly probing burrow entrances and entering unoccupied areas. Large numbers of limnoriids were also present in the galleries, but were seemingly ignored by *T. gomezi*; at least no apparent interaction between the two was detected.

Defensive posturing behavior by *T. gomezi* was also noted. Thus, when a free-roaming individual investigated a burrow already occupied, the animal occupying the burrow would turn on its back and place the dorsal surface of its urosome (with uropods flared laterally) across the burrow entrance and thereby prevent further encroachment by the potential invader. The heavily calcified, quadrate urosome seems well-adapted to such defensive behavior. As *T. gomezi* infests timbers in large numbers, overcrowding would presumably be lessened by such spatial partitioning of its burrows. Specimen size appears to play little part in defensive posturing as large and small specimens seemed equally successful in repelling intruders.

No studies were made on rates of wood-rasping in *T. gomezi* and other chelurids; although presumably tropical forms, working in higher average temperatures would degrade wooden structures at a faster rate than their temperate counterparts. For further detailed discussion of chelurid ecology, the reader may consult the work of Barnard (1955) on the behavioral ecology of *Chelura terebrans* in Los Angeles Harbor.

Acknowledgments

I would like to thank Joan Ellis of the British Museum (Natural History), Dr. J. L. Barnard of the National Museum of Natural History, and Roger Zimmerman of the University of Puerto Rico for the loan of specimens during this study. Dr. Barnard, Dr. Pat McGlaughlin, and Dr. E. L. Bousfield kindly reviewed a preliminary manuscript. Dr. Bill Kruczynski identified the limnoriid isopods taken during the study. Thanks are also due to Linda Lutz for inking the plates and preparing them for publication.

This research was supported by the National Science Foundation, grant #DEB77-15883.

Literature Cited

Barnard, J. L. 1955. The wood-boring habits of *Chelura terebrans* Philippi in Los Angeles Harbor.—Essays Nat. Sci. Honor Capt. Allan Hancock, Hancock Fd. pp. 87–98, pls. 1–2.

———. 1959. Generic partition in the amphipod family Cheluridae, marine wood borers.—Pacific Nat. 1(3):1–12, figs. 1–5.

———. 1971. Keys to the Hawaiian marine Gammaridea, 0–30 meters.—Smith. Contr. Zoology 58:1–135, figs. 1–68.

Calman, W. T. 1910. On two new species of wood-boring Crustacea from Christmas Island.—Ann. Mag. Nat. Hist. (8)5:181–186, pl. 5.

Miller, R. C. 1924. Wood-boring Crustacea from Hawaii and Samoa.—Univ. Calif. Pub. Zool. 26(8):159–164, pls. 12, 13.

Philippi, A. 1839. Einige zoologische notizen.—Arch. Naturgesch. 5:113–134, pls. 3–4.

Ortiz, M. 1976. Un neuvo antipodo perforador de madera (Amphipoda, Gammaridea, Cheluridae) de aguas Cubanas.—Invest. Marinas 8:21–26, figs. 1–2.

Newfound Harbor Marine Institute, Big Pine Key, Florida 33043.